doubted whether she will ever again attain the ascendancy in certain departments which she has now sacrificed by her unscrupulous greed, bad faith, and insatiable rapacity. It now rests with the manufacturers and workers in this country to determine how far they mean to share that prosperity with America and Japan.

MODERN DEVELOPMENTS IN METALLURGY.

(1) *Ingots and Ingot Moulds.* By A. W. Brearley and H. Brearley. Pp. xv+218. (London: Longmans, Green, and Co., 1918.) Price 16*s*. net.

(2) *Industrial Electro-metallurgy, including Electrolytic and Electro-thermal Processes.* By Dr. E. K. Rideal. Pp. xii+247. ("Industrial Chemistry.") (London: Baillière, Tindall, and Cox, 1918.) Price 7*s*. 6*d*. net.

(1) THE authors of this book are respectively the steel-maker and works manager at one of the large Sheffield steel works, and their book is dedicated to the workmen in appreciation of their efforts to reach the ideal in actual work. They state that a considerable part of it was prepared for teaching purposes, and that the manuscript sheets have been freely criticised by men whose business it is to make steel ingots. As they point out, there is no way of studying the conditions which lead to the production of good and bad ingots more instructive than that of making ingots themselves, according to well-defined variations of the processes of ingot-making, and cutting or breaking them in order to observe their qualities. In former days a good opportunity for such observations was enjoyed at negligible cost by the crucible steel melter, when ingots were "topped" down until the pipe or other evidences of unsoundness were broken away. Such a man knew what the conditions of casting were; he was familiar with the state of the ingot mould; he saw daily perhaps from twenty to forty ingots "topped" down to nearly half their length, and his eye was trained to notice minute differences in the appearance of the fractured surfaces. Such opportunities scarcely exist to-day, because ingots are only rarely "topped."

Undoubtedly the most trustworthy way of ascertaining the changes which occur in the casting, freezing, and cooling of steel ingots would be to experiment with the steel itself. Such a method, however, involves a costly plant and an expensive material which would require handling by an experienced person. The authors, therefore, set about discovering a material which is considerably more manageable, and they finally fixed on stearin wax, which, they maintain, exhibits a close resemblance to steel in much of its behaviour. They say: "With a few pounds of stearin, a pan of water, a beaker, a Bunsen burner, a spirit lamp, a few tin moulds, and a lot of patience, a great number of observations can be made to illustrate, extend, and also in some respects to correct prevailing notions about steel ingots"; and one of the objects of their book is to commend the use of stearin for teaching purposes and to show how it may be applied to elucidate many of the difficulties relating to ingots and ingot moulds. By its aid they have studied the formation of pipe and secondary shrinkage cavities, the influence exerted on these by the shape and dimensions of the mould, the advantage or otherwise of feeder heads, the influence of casting temperatures on the soundness and strength of the ingots, and the location and effects of segregation. Their use of stearin has been freely criticised by other steel experts, but it appears to the present writer that the authors realise the limitations of the use of this material, and it is difficult to be otherwise than favourably impressed by the confession in their preface that they are "less confident than formerly that they are qualified to elucidate the art of ingot-making."

The book deals with the following subjects: (1) Crystalline structure and its effects; (2) shrinkage and contraction cavities; (3) casting temperatures; (4) ingot moulds; (5) methods of casting; (6) sound ingots; (7) blowholes; (8) segregation; (9) slag occlusions; (10) influence of ingot defects on forged steel. It is well written, plentifully illustrated, and deserving of careful study by those who desire to familiarise themselves with the subject.

(2) Dr. Rideal's book gives in succinct and well-written form an outline of modern industrial electro-metallurgy; in fact, the scope of the work is even wider than the title suggests, for three out of its eight sections deal with products which are not metallic. After a brief scientific introduction the author deals with electrolysis first in aqueous solutions, and then in fused electrolytes. Then follows a brief section on the electrolytic preparation of the rarer metals, succeeded by one on electro-thermal processes, in which, as the title indicates, only the heat generated by an electric current is used in the extraction of the metal. After this comes a section on the preparation of carborundum, and the oxy-silicides of carbon, the carbides, and the electro-thermal fixation of nitrogen by metals and metallic compounds. The concluding section deals with iron and the ferro-alloys. Electro-metallurgy has undergone very important technical developments in recent years, and Dr. Rideal is to be warmly commended for his attempt to indicate the limits and the possibilities of the application of electrolytic and electro-thermal methods in the industry.

H. C. H. C.

A NATURAL HISTORY OF PHEASANTS.

A Monograph of the Pheasants. By William Beebe. In four volumes. Vol. i. Pp. xlix+198. (Published in England under the auspices of the New York Zoological Society by Witherby and Co., London, 1918.) Price 12*l*. 10*s*. per volume.

THIS stately volume is the first of four to be devoted to the life-histories of the beautiful and interesting birds included in the pheasant family. Its outstanding merits are the beauty of

© 1918 Nature Publishing Group

its plates, which are charmingly reproduced direct from drawings by the best bird artists of the day, the extensive series of photogravures engraved from the author's photographs of the haunts of the various species, and the graphic and popular descriptions of their habits from studies made amid their native wilds. These and other features render the work far in advance of all other books written on the subject, and make it welcome alike to the ornithologist, the aviculturist, and the sportsman.

In order to carry out the author's ideals of what a monograph should be, an expedition was organised to visit the metropolis of pheasantdom in temperate and tropical Asia, where, in Ceylon, India, Burma, China, Japan, the Malay States, Borneo, and Java, seventeen months in all were spent. That such an expedition should have been possible was due to the generosity of Col. Anthony R. Kuser, of Bernardsville, New Jersey, to whom and his wife the work is fittingly dedicated. But this is not all. With the view of supplementing first-hand knowledge, Mr. Beebe visited a number of the leading museums in Europe in order to study specimens in their cabinets and to consult their libraries.

The scope of the work may well be described as exhaustive. The introduction embraces a general account, including the historical aspect of the subject from the earliest times, classification, distribution, comparative abundance, voice, flight and gait, daily round of life (food, roosts, friends and foes), protective coloration, home life, and relation to man. Under the last heading it is distressing to learn that even in their remote haunts amid the highest mountains of the Old World these birds, mainly from the remarkable beauty of their plumage, are rapidly becoming extinct through persecution. Mr. Beebe tells us that for many years they have paid a heavy toll to the millinery trade. It is known, for example, that some years ago 45,000 Impeyan pheasants had been slaughtered; Mr. Beebe himself has seen huge bales of feathers of the silver pheasant, and Nepal and China still export large quantities. Now that the Chinese have adopted a meat diet, pheasants are no longer immune, save where Buddhists and Hindus hold sway, and they are everywhere trapped, snared, pierced with poisoned arrows from crossbow or blowpipe, or slain by repeating shot-guns. It is gratifying to know that in the British-governed regions they are protected by well-regulated game laws, and the brooding hens and chicks are free from persecution. In this connection it is important to learn that the birds do very little damage to crops, and when they appear among them it is insect life which is the main attraction.

As regards the classification of the family, the grouping of the numerous genera under subfamilies has never been satisfactory. Mr. Beebe, however, after much careful study, discovered a new character—namely, the "regular sequence in the moulting of the tail feathers," which holds good throughout the life of the bird, and agrees also with "assumed relationships which had hitherto been taken for granted." The following are the sub-families adopted: Perdicinæ, Phasianinæ, Argusianinæ, and Pavoninæ; and the various genera grouped under them are indicated. Since our author includes the Perdicinæ in his scheme, yet treats of only two of its genera, namely, Ithagenes and Tragopan, omitting many others, the work can scarcely be regarded as a complete treatise of "The Pheasants of the World." It will deal, however, with nearly one hundred forms.

The systematic treatment of the subject is on the same exhaustive lines. The volume already issued treats of twenty-one species: the blood pheasants (Ithagenes), the Tragopans or horned pheasants (Tragopan), the Impeyans (Impeyanus), and the eared pheasants (Crossoptilon). For each of these species are given the generic and specific characters; scientific, English, native, French, and German names; full descriptions of the various stages of plumage, moults, variation, hybrids, parasites, internal anatomy, characteristics as observed in their haunts, geographical distribution, migrations, food, nests and eggs. It is embellished with twenty-two coloured plates by Messrs. A. Thorburn, G. E. Lodge, C. R. Knight, and H. Gronvold, fifteen photogravures, and five maps. The volume is sumptuous in all respects except the binding, which does not come up to the standard of the rest.

While Mr. Beebe's fine work merits the highest praise, it is greatly to be regretted that its price (50*l.*) places it beyond the reach of the vast majority of those who would appreciate and use it.

W. E. C.

OUR BOOKSHELF.

An Elementary Treatise on Curve Tracing. By Dr. P. Frost. Fourth edition, revised by Dr. R. J. T. Bell. Pp. xvi + 210. (London: Macmillan and Co., Ltd., 1918.) Price 12*s.* 6*d.* net.

EVERY mathematician will welcome this new edition of a classical work if only as an indication that the demand for it has not diminished since it was originally published, forty-six years ago. Although the modern tendency is away from the excessive zeal for examples and exercises of a past generation, the mathematical student will derive much benefit from excursions on this "very pleasant path, on which he may exercise in an agreeable way all his mathematical limbs," especially as curve plotting is a necessity in all branches of modern science. A valuable feature of the book is the sketch of the inverse process of finding the equation of a curve the graph of which is given. Further work on this branch of the subject would be very useful.

This is the first revised edition; the second and third issues were mere reprints of the first edition. The editor has discharged his duties with restraint, and he has introduced several improvements. The printing is more compact and the use of leaded type conduces to comfort in reading. Additional

© 1918 Nature Publishing Group